

**PRELIMINARY  
DRAINAGE REPORT  
  
FOR  
  
457-459 NORTH HOPE AVE.**

**CLIENT:** Ms. Trudi Carey  
5325 Calle Real  
Santa Barbara, CA 93111

**PREPARED BY:** Michael A. Caccese  
MAC Design Associates  
1933 Cliff Drive, Suite 6  
Santa Barbara, CA 93110

**DATE:** July 30, 2010

**W.O.** 0359

**EXHIBIT F**

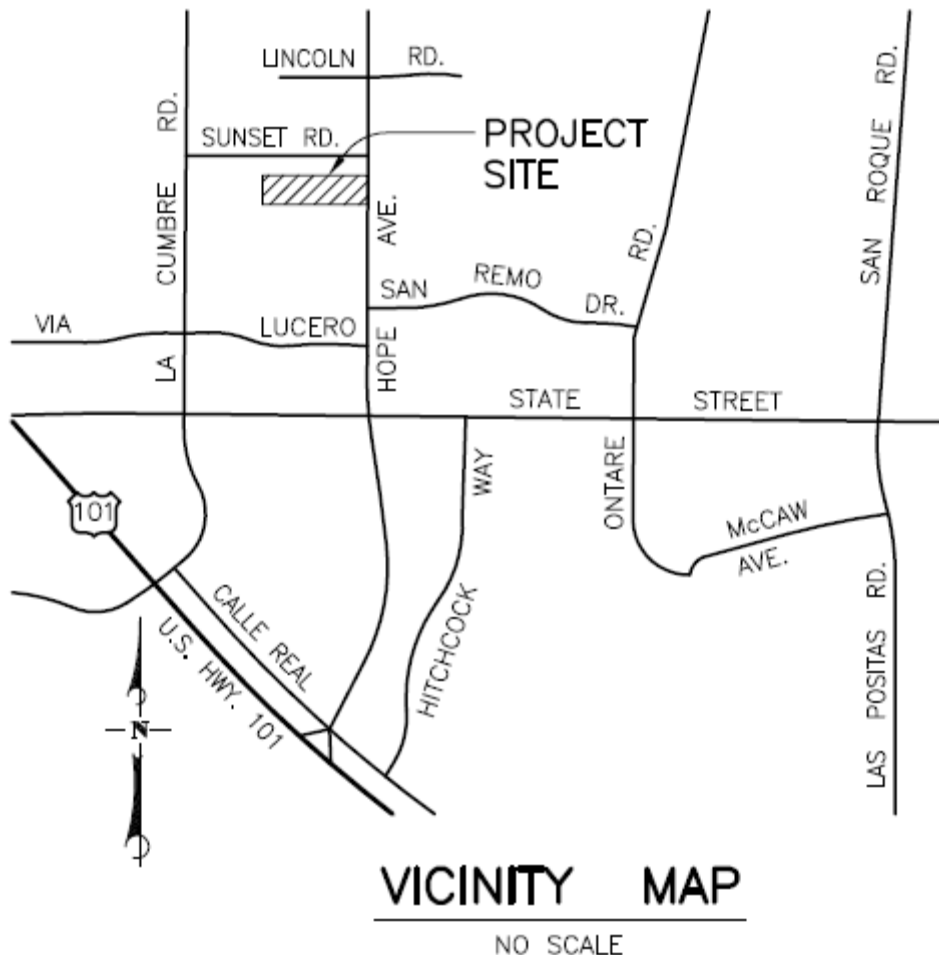
**MAC DESIGN ASSOCIATES**



## **PURPOSE OF REPORT**

The purpose of this report is to summarize the pre and post project runoff from the 457 – 459 Hope Avenue project site.

## **LOCATION OF SITE**



## **METHODOLOGY**

The property is approximately 2.90 acres in size, and is currently developed with single family dwellings and accessory structures. Currently, there is approximately 0.42 acres of impervious area on the property. The current drainage patterns on the property is 1.61 acres drains towards the west to an existing concrete ditch, and 1.29 acres drains towards the east to Hope Avenue. The project will maintain the existing drainage patterns, with Lots 1 – 4 draining towards Hope Avenue, and Lots 5-9 draining towards the existing drainage ditch located along the west property line of the project.

**MAC DESIGN ASSOCIATES**

The project proposes to demolish the existing dwellings, accessory structures, and driveways and redevelop the property with 9 single family residential units.

For post-development runoff calculations, this report will conservatively assume the proposed project will result in approximately 4,000 SF of impervious area per lot, plus the additional impervious area for the new road & cul-de-sac. A preliminary drainage plan has been prepared, and is attached.

Easterly runoff: Lots 1-4 will each drain to individual rear yard retention basins, and then to the gutter of North Hope Ave. via a sidewalk underdrain. The easterly portion of the new Cul-de-Sac/Driveway will drain to an on-site retention basin, and then to the gutter of North Hope Ave. via a sidewalk underdrain. The retention basins will reduce runoff rates to less than pre-project levels.

Westerly runoff: Lots 5-9 will each drain to individual front or rear yard retention basins, and then to a concrete ditch along the west property line. The westerly portion of the new Cul-de-Sac/Driveway will drain to an on site retention basin and then to the same concrete ditch along the west property line. The retention basins will reduce runoff rates to less than pre-project levels.

This is a lot sale subdivision, therefore the impervious area for All Lots was assumed to be 4,000 s.f. which would include the building roof area, patio, walkways and driveway. Each lot owner will need to prepare a final drainage report for their specific improvements. Adjustments to the size of the basin may be required due to an increased impervious area. In addition, the use of pervious surfacing for driveways, walks and patios may be used to reduce the amount of impervious surface and reduce the size of the detention basin. The detention basins have been designed as at-grade facilities. The owner's of these lots may, with the approval of the City, utilize other means to detain water flow and maintain pre-development runoff. These may include an underground storage system such as the Storm Tech chamber system, oversized storm drain pipes or the Flo-Well manufactured dry well system produced by NDS. The basins will reduce runoff rates to less than pre-project levels.

The anticipated storm water runoff was calculated using HydroCad software, with the Santa Barbara Urban Hydrograph (SBUH) method. All input parameters are in accordance the Santa Barbara County Flood Control District (SBCFD) standards. Calculations are provided for the 2 year, 5 year, 10 year, 25 year, 50 year and 100 year storm events, and the 1"- 24 hour storm event.

The time of concentration was established using Santa Barbara County nomograph. Due to the small size of the site, the pre-project time of concentration was at 15 minutes. The post-project time of concentration was conservatively chosen at the minimum of 12 minutes. Hydrologic Soil Group for the project site is Group D (highest runoff potential) per the Natural Resources Conservation Service (NRCS) Web Soil Survey, as attached.

## **CONCLUSIONS**

Through the use of the proposed retention basins, runoff rates from the project will not exceed the pre-project runoff rates for all design storms. Runoff calculations are included below, and indicate that no increase in runoff will occur due to the project.

### **EASTERLY RUNOFF**

#### **OVERALL CHANGE IN RUNOFF – ALL STORM EVENTS**

<b>Storm Event</b>	<b>Pre Project Runoff (cfs)</b>	<b>Post Project Runoff (cfs)</b>	<b>Overall change in runoff (cfs)</b>
1”-24hour	0.08	0.20	+0.12
2year	1.18	1.24	+0.06
5year	2.06	2.00	-0.06
10year	2.67	2.48	-0.19
25year	3.42	3.07	-0.35
50year	3.98	3.48	-0.50
100year	4.52	3.87	-0.65

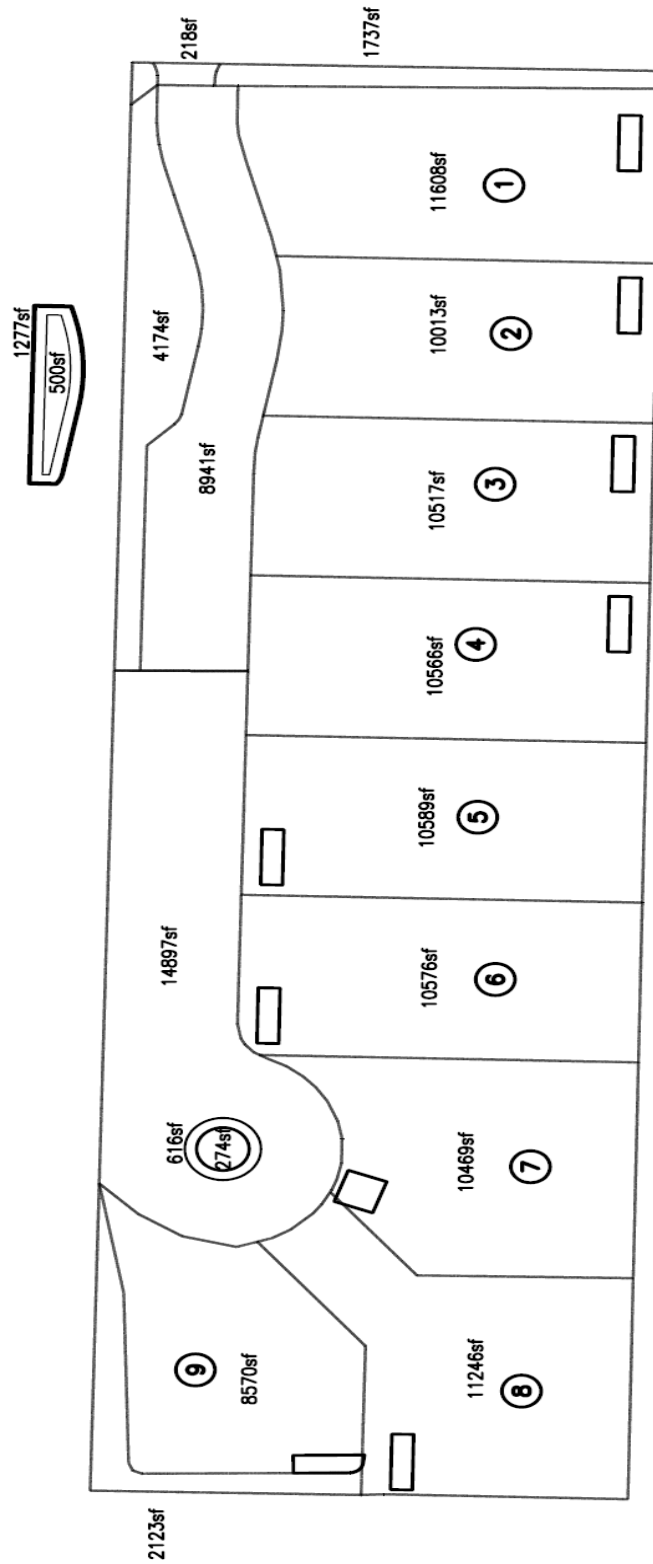
### **WESTERLY RUNOFF**

#### **OVERALL CHANGE IN RUNOFF – ALL STORM EVENTS**

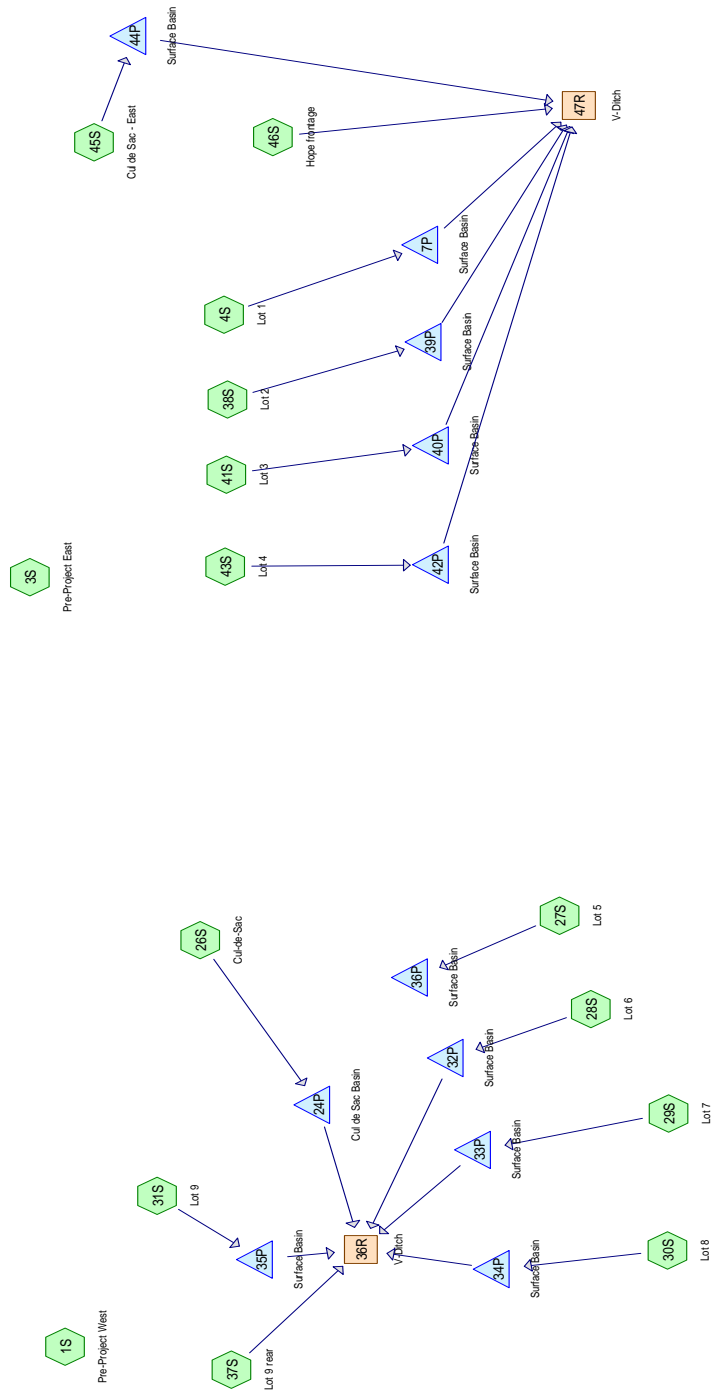
<b>Storm Event</b>	<b>Pre Project Runoff (cfs)</b>	<b>Post Project Runoff (cfs)</b>	<b>Overall change in runoff (cfs)</b>
1”-24hour	0.15	0.26	+0.11
2year	1.44	1.29	-0.15
5year	2.45	2.03	-0.42
10year	3.14	2.50	-0.64
25year	4.00	3.07	-0.93
50year	4.63	3.47	-1.16
100year	5.24	3.84	-1.40

## **CALCULATIONS**

# LOT DIAGRAM



## HYDROCAD DIAGRAM





## EAST - PRE PROJECT 25-YEAR STORM EVENT

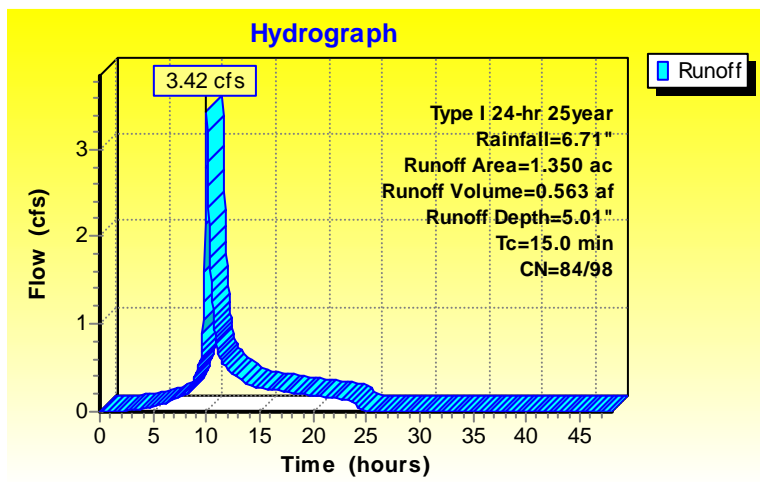
### Summary for Subcatchment 3S: Pre-Project East

Runoff = 3.42 cfs @ 9.99 hrs, Volume= 0.563 af, Depth= 5.01"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (ac)	CN	Description
1.230	84	50-75% Grass cover, Fair, HSG D
0.120	98	Paved parking & roofs
1.350	85	Weighted Average
1.230	84	Pervious Area
0.120	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,



## **EAST - PRE PROJECT ALL STORM EVENTS**

### **Events for Subcatchment 3S: Pre-Project East**

Event	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
2year	1.18	0.202	1.80
5year	2.06	0.343	3.05
10year	2.67	0.440	3.91
25year	3.42	0.563	5.01
50year	3.98	0.655	5.82
100year	<b>4.52</b>	<b>0.744</b>	<b>6.61</b>
BMP	0.08	0.023	0.21

## EAST - POST PROJECT 25-YEAR STORM EVENT

### DRIVEWAY/CUL DE SAC – 25 YEAR STORM EVENT

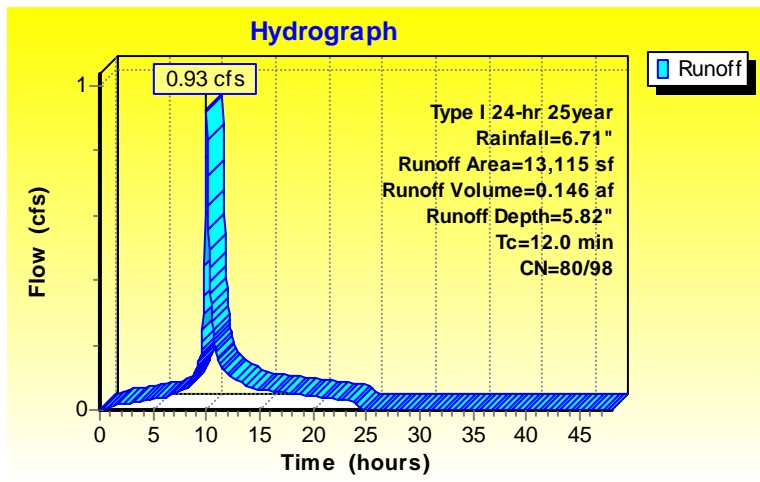
#### Summary for Subcatchment 45S: Cul de Sac - East

Runoff = 0.93 cfs @ 9.98 hrs, Volume= 0.146 af, Depth= 5.82"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
8,941	98	Paved parking & roofs
4,174	80	>75% Grass cover, Good, HSG D
13,115	92	Weighted Average
4,174	80	Pervious Area
8,941	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



## DRIVEWAY/CUL DE SAC BASIN ROUTING – 25 YEAR STORM EVENT

### Summary for Pond 44P: Surface Basin

Inflow Area = 0.301 ac, 68.17% Impervious, Inflow Depth = 5.82" for 25year event  
 Inflow = 0.93 cfs @ 9.98 hrs, Volume= 0.146 af  
 Outflow = 0.49 cfs @ 10.26 hrs, Volume= 0.146 af, Atten= 48%, Lag= 16.6 min  
 Primary = 0.49 cfs @ 10.26 hrs, Volume= 0.146 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 1.51' @ 10.26 hrs Surf.Area= 506 sf Storage= 754 cf

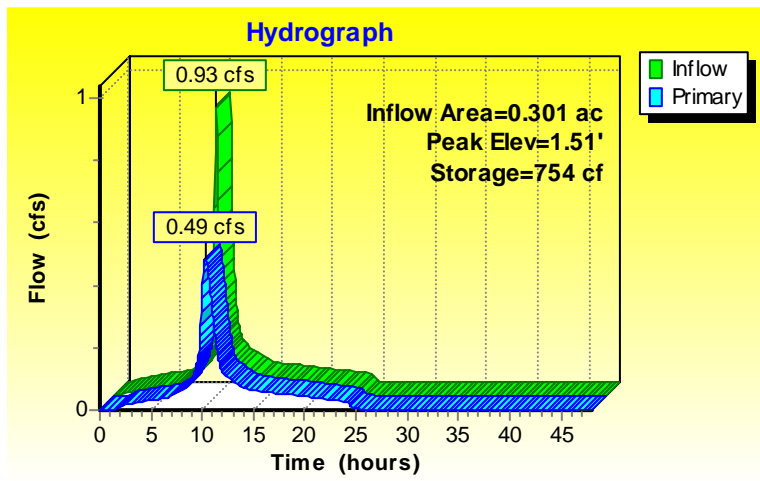
Plug-Flow detention time= 23.2 min calculated for 0.146 af (100% of inflow)  
 Center-of-Mass det. time= 23.5 min ( 741.2 - 717.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	1,639 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	500	0	0
1.50	500	750	750
2.50	1,277	889	1,639

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	<b>4.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.49 cfs @ 10.26 hrs HW=1.51' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.49 cfs @ 5.57 fps)



## LOT 1 + LOT 1 BASIN ROUTING – 25 YEAR STORM EVENT

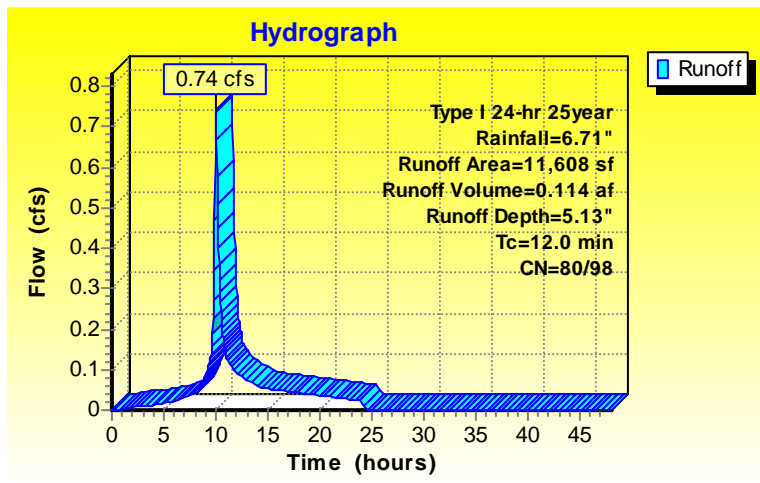
### Summary for Subcatchment 4S: Lot 1

Runoff = 0.74 cfs @ 9.98 hrs, Volume= 0.114 af, Depth= 5.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
4,000	98	Paved parking & roofs
7,608	80	>75% Grass cover, Good, HSG D
11,608	86	Weighted Average
7,608	80	Pervious Area
4,000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



### Summary for Pond 7P: Surface Basin

Inflow Area = 0.266 ac, 34.46% Impervious, Inflow Depth = 5.13" for 25year event  
 Inflow = 0.74 cfs @ 9.98 hrs, Volume= 0.114 af  
 Outflow = 0.67 cfs @ 10.05 hrs, Volume= 0.114 af, Atten= 9%, Lag= 3.8 min  
 Primary = 0.67 cfs @ 10.05 hrs, Volume= 0.114 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 0.76' @ 10.05 hrs Surf.Area= 200 sf Storage= 152 cf

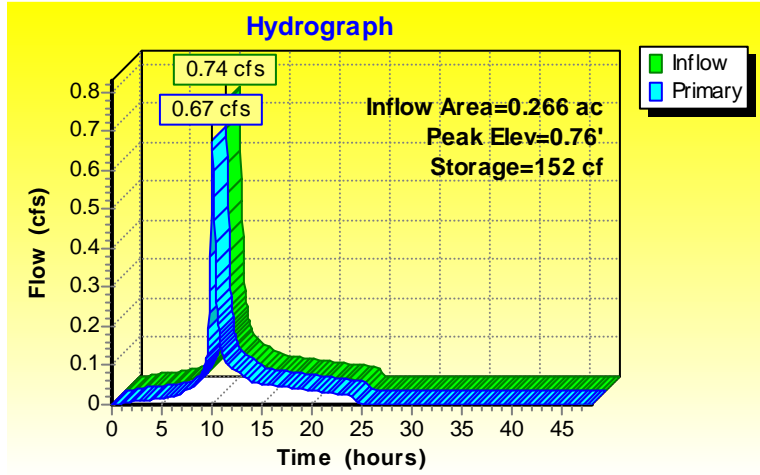
Plug-Flow detention time= 7.3 min calculated for 0.114 af (100% of inflow)  
 Center-of-Mass det. time= 7.4 min ( 753.1 - 745.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	200	0	0
1.50	200	300	300

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.67 cfs @ 10.05 hrs HW=0.76' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.67 cfs @ 3.43 fps)



## LOT 2 + LOT2 BASIN ROUTING – 25 YEAR STORM EVENT

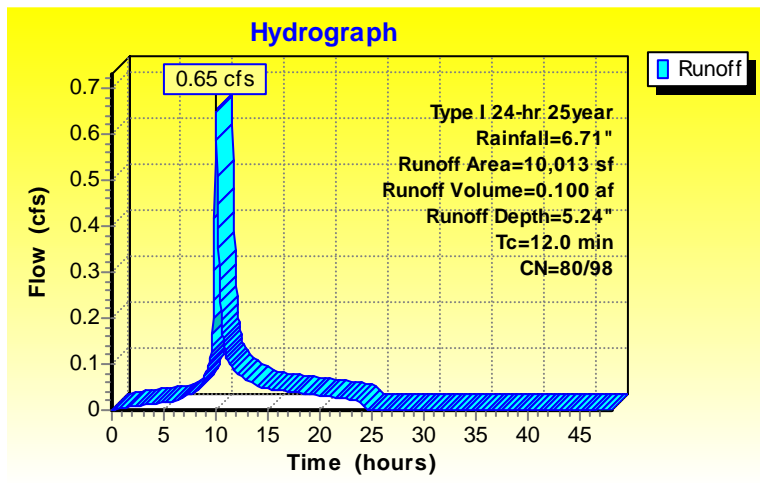
### Summary for Subcatchment 38S: Lot 2

Runoff = 0.65 cfs @ 9.98 hrs, Volume= 0.100 af, Depth= 5.24"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
4,000	98	Paved parking & roofs
6,013	80	>75% Grass cover, Good, HSG D
10,013	87	Weighted Average
6,013	80	Pervious Area
4,000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



### Summary for Pond 39P: Surface Basin

Inflow Area = 0.230 ac, 39.95% Impervious, Inflow Depth = 5.24" for 25year event  
 Inflow = 0.65 cfs @ 9.98 hrs, Volume= 0.100 af  
 Outflow = 0.60 cfs @ 10.04 hrs, Volume= 0.100 af, Atten= 8%, Lag= 3.5 min  
 Primary = 0.60 cfs @ 10.04 hrs, Volume= 0.100 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 0.65' @ 10.04 hrs Surf.Area= 200 sf Storage= 130 cf

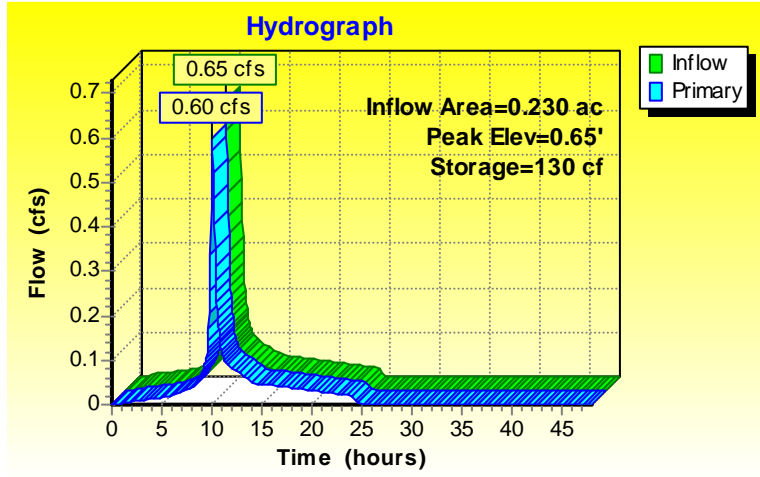
Plug-Flow detention time= 7.6 min calculated for 0.100 af (100% of inflow)  
 Center-of-Mass det. time= 7.8 min ( 748.5 - 740.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	200	0	0
1.50	200	300	300

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.60 cfs @ 10.04 hrs HW=0.65' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.60 cfs @ 3.04 fps)





## LOT 3 + LOT 3 BASIN ROUTING – 25 YEAR STORM EVENT

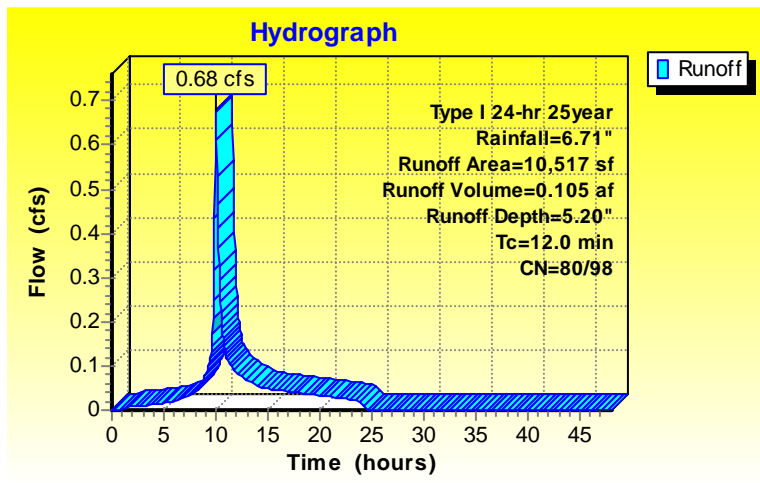
### Summary for Subcatchment 41S: Lot 3

Runoff = 0.68 cfs @ 9.98 hrs, Volume= 0.105 af, Depth= 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
4,000	98	Paved parking & roofs
6,517	80	>75% Grass cover, Good, HSG D
10,517	87	Weighted Average
6,517	80	Pervious Area
4,000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



### Summary for Pond 40P: Surface Basin

Inflow Area = 0.241 ac, 38.03% Impervious, Inflow Depth = 5.20" for 25year event  
 Inflow = 0.68 cfs @ 9.98 hrs, Volume= 0.105 af  
 Outflow = 0.62 cfs @ 10.04 hrs, Volume= 0.105 af, Atten= 8%, Lag= 3.6 min  
 Primary = 0.62 cfs @ 10.04 hrs, Volume= 0.105 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 0.68' @ 10.04 hrs Surf.Area= 200 sf Storage= 137 cf

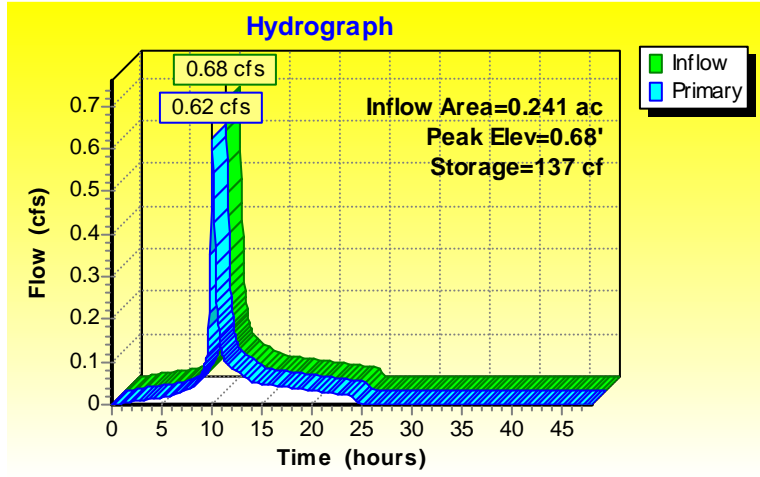
Plug-Flow detention time= 7.5 min calculated for 0.105 af (100% of inflow)  
 Center-of-Mass det. time= 7.7 min ( 750.0 - 742.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	200	0	0
1.50	200	300	300

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.62 cfs @ 10.04 hrs HW=0.68' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.62 cfs @ 3.16 fps)



## LOT 4 + LOT 4 BASIN ROUTING – 25 YEAR STORM EVENT

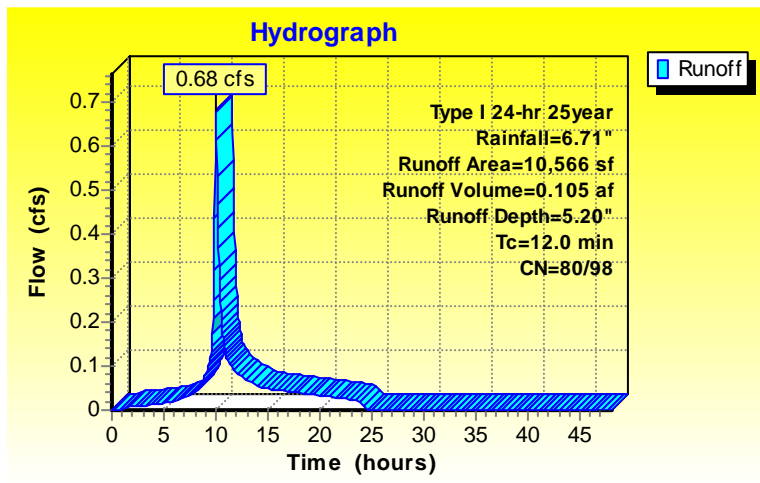
### Summary for Subcatchment 43S: Lot 4

Runoff = 0.68 cfs @ 9.98 hrs, Volume= 0.105 af, Depth= 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
4,000	98	Paved parking & roofs
6,566	80	>75% Grass cover, Good, HSG D
10,566	87	Weighted Average
6,566	80	Pervious Area
4,000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



### Summary for Pond 42P: Surface Basin

Inflow Area = 0.243 ac, 37.86% Impervious, Inflow Depth = 5.20" for 25year event  
 Inflow = 0.68 cfs @ 9.98 hrs, Volume= 0.105 af  
 Outflow = 0.63 cfs @ 10.04 hrs, Volume= 0.105 af, Atten= 8%, Lag= 3.6 min  
 Primary = 0.63 cfs @ 10.04 hrs, Volume= 0.105 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 0.69' @ 10.04 hrs Surf.Area= 200 sf Storage= 138 cf

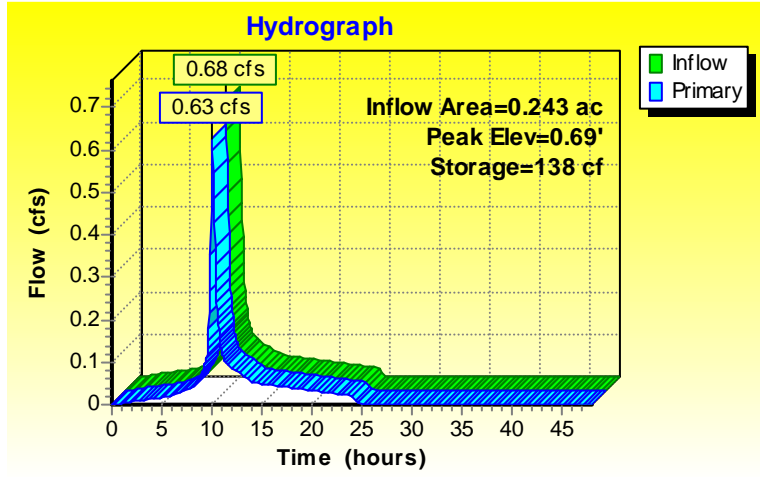
Plug-Flow detention time= 7.5 min calculated for 0.105 af (100% of inflow)  
 Center-of-Mass det. time= 7.6 min ( 750.2 - 742.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
0.00	200	0	0
1.50	200	300	300

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	<b>6.0" Vert. Orifice/Grate</b> C=0.600

**Primary OutFlow** Max=0.62 cfs @ 10.04 hrs HW=0.69' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.62 cfs @ 3.18 fps)



## HOPE AVE. FRONTAGE – 25 YEAR STORM EVENT

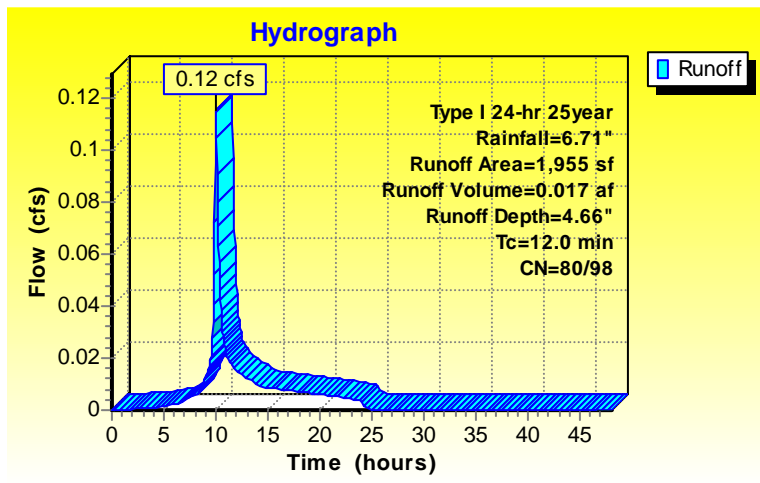
### Summary for Subcatchment 46S: Hope frontage

Runoff = 0.12 cfs @ 9.99 hrs, Volume= 0.017 af, Depth= 4.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
218	98	Paved parking & roofs
1,737	80	>75% Grass cover, Good, HSG D
1,955	82	Weighted Average
1,737	80	Pervious Area
218	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



## **EAST - POST PROJECT ALL STORM EVENTS**

### **Events for Reach 47R: V-Ditch**

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2year	1.24	1.24	-0.83	10
5year	2.00	1.99	-0.77	14
10year	2.48	2.48	-0.74	16
25year	3.07	3.06	-0.71	19
50year	3.48	3.48	-0.68	21
100year	<b>3.87</b>	<b>3.87</b>	<b>-0.66</b>	<b>23</b>
BMP	0.20	0.20	-0.94	3

## WEST - PRE PROJECT 25-YEAR STORM EVENT

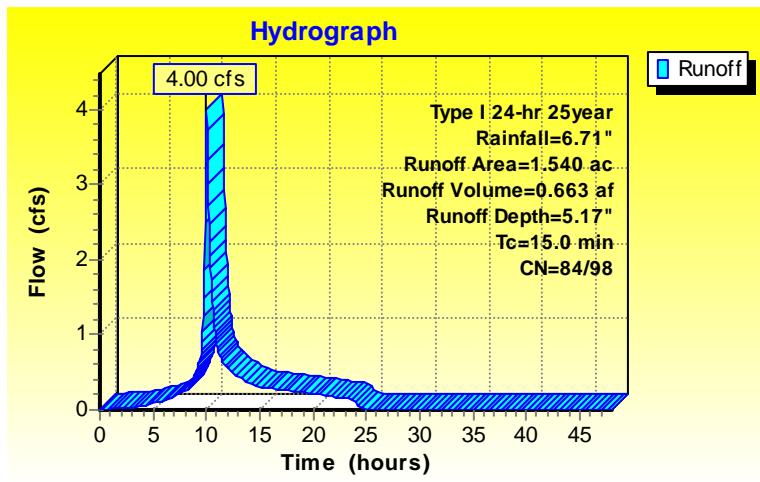
### Summary for Subcatchment 1S: Pre-Project West

Runoff = 4.00 cfs @ 9.99 hrs, Volume= 0.663 af, Depth= 5.17"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (ac)	CN	Description
1.250	84	50-75% Grass cover, Fair, HSG D
0.290	98	Paved parking & roofs
1.540	87	Weighted Average
1.250	84	Pervious Area
0.290	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.0					Direct Entry,



## **WEST - PRE PROJECT ALL STORM EVENTS**

### **Events for Subcatchment 1S: Pre-Project Wes**

Event	Runoff (cfs)	Volume (acre-feet)	Depth (inches)
2year	1.44	0.247	1.92
5year	2.45	0.409	3.19
10year	3.14	0.522	4.07
25year	4.00	0.663	5.17
50year	4.63	0.768	5.98
100year	<b>5.24</b>	<b>0.870</b>	<b>6.78</b>
BMP	0.15	0.035	0.27



## WEST - POST PROJECT 25-YEAR STORM EVENT

### DRIVEWAY/CUL-DE-SAC – 25 YEAR STORM EVENT

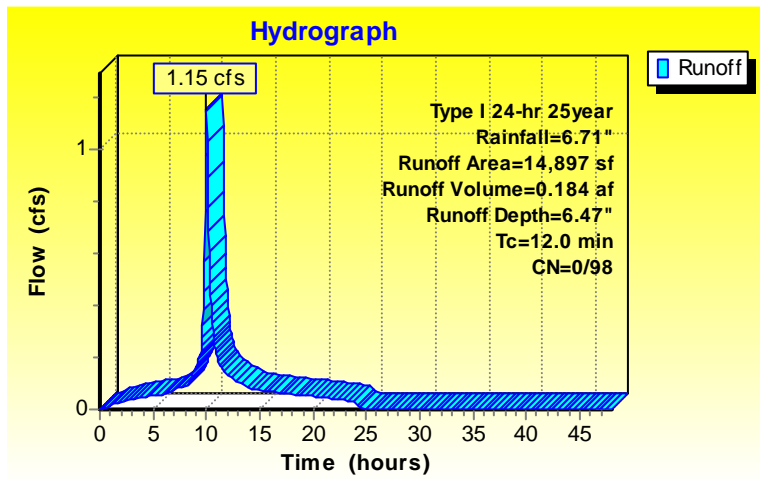
#### Summary for Subcatchment 26S: Cul-de-Sac

Runoff = 1.15 cfs @ 9.98 hrs, Volume= 0.184 af, Depth= 6.47"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
14,897	98	Paved parking & roofs
14,897	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



## DRIVEWAY/CUL DE SAC - BASIN ROUTING – 25 YEAR STORM EVENT

### Summary for Pond 24P: Cul de Sac Basin

Inflow Area = 0.342 ac, 100.00% Impervious, Inflow Depth = 6.47" for 25year event  
 Inflow = 1.15 cfs @ 9.98 hrs, Volume= 0.184 af  
 Outflow = 0.55 cfs @ 10.29 hrs, Volume= 0.184 af, Atten= 52%, Lag= 18.7 min  
 Primary = 0.55 cfs @ 10.29 hrs, Volume= 0.184 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
 Peak Elev= 254.40' @ 10.29 hrs Surf.Area= 810 sf Storage= 1,011 cf

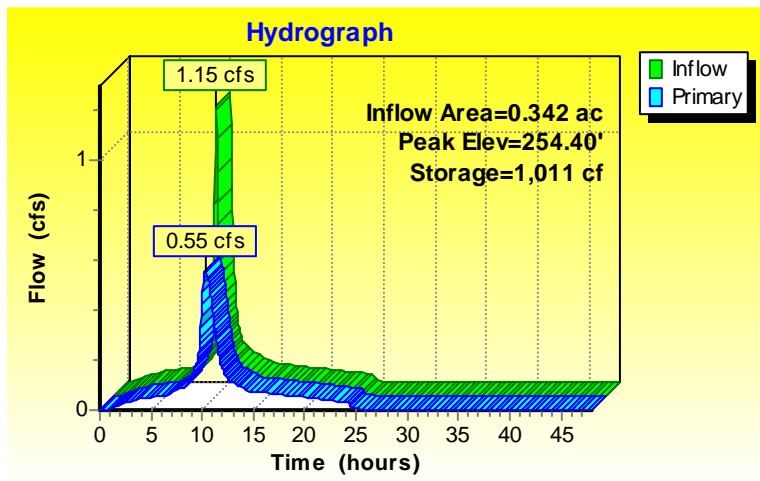
Plug-Flow detention time= 23.6 min calculated for 0.184 af (100% of inflow)  
 Center-of-Mass det. time= 23.2 min ( 719.9 - 696.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	252.50'	1,639 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
252.50	500	0	0
254.00	500	750	750
255.00	1,277	889	1,639

Device	Routing	Invert	Outlet Devices
#1	Primary	252.50'	<b>4.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.55 cfs @ 10.29 hrs HW=254.40' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.55 cfs @ 6.34 fps)



## LOT 5 + LOT 5 BASIN ROUTING - 25 YEAR EVENT

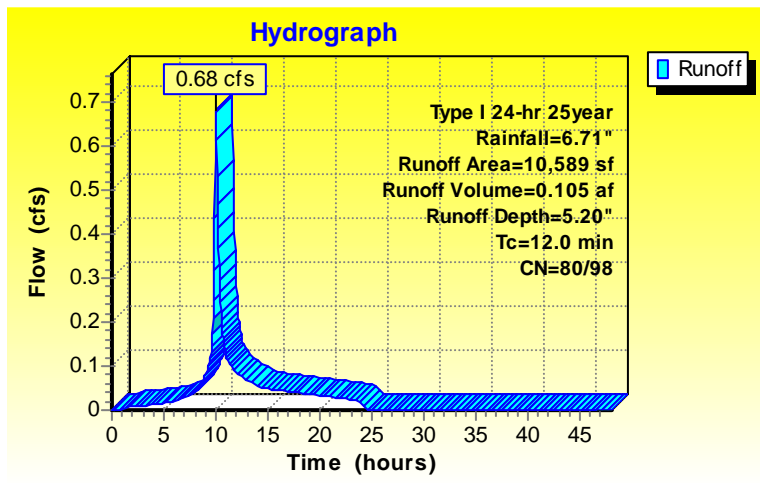
### Summary for Subcatchment 27S: Lot 5

Runoff = 0.68 cfs @ 9.98 hrs, Volume= 0.105 af, Depth= 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
4,000	98	Paved parking & roofs
6,589	80	>75% Grass cover, Good, HSG D
10,589	87	Weighted Average
6,589	80	Pervious Area
4,000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



### Summary for Pond 36P: Surface Basin

Inflow Area = 0.243 ac, 37.78% Impervious, Inflow Depth = 5.20" for 25year event  
 Inflow = 0.68 cfs @ 9.98 hrs, Volume= 0.105 af  
 Outflow = 0.63 cfs @ 10.05 hrs, Volume= 0.105 af, Atten= 8%, Lag= 3.6 min  
 Primary = 0.63 cfs @ 10.05 hrs, Volume= 0.105 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
 Peak Elev= 251.19' @ 10.05 hrs Surf.Area= 200 sf Storage= 139 cf

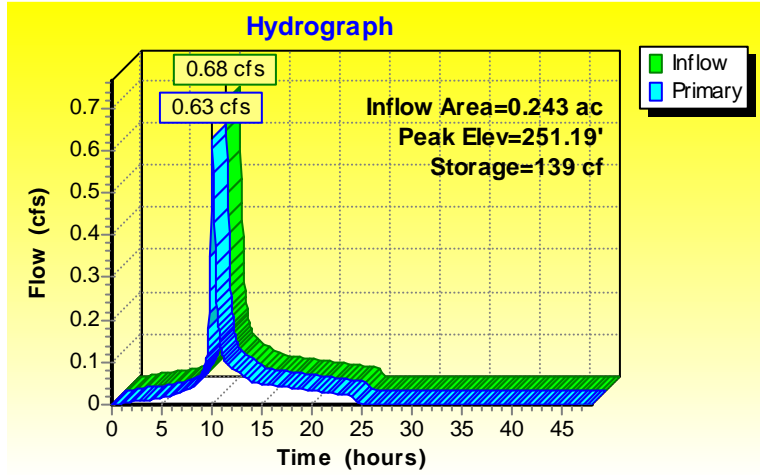
Plug-Flow detention time= 8.2 min calculated for 0.105 af (100% of inflow)  
 Center-of-Mass det. time= 7.6 min ( 750.3 - 742.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	250.50'	300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
250.50	200	0	0
252.00	200	300	300

Device	Routing	Invert	Outlet Devices
#1	Primary	250.50'	<b>6.0" Vert. Orifice/Grate</b> C=0.600

**Primary OutFlow** Max=0.63 cfs @ 10.05 hrs HW=251.19' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.63 cfs @ 3.19 fps)



## LOT 6 + LOT 6 BASIN ROUTING 25 YEAR EVENT

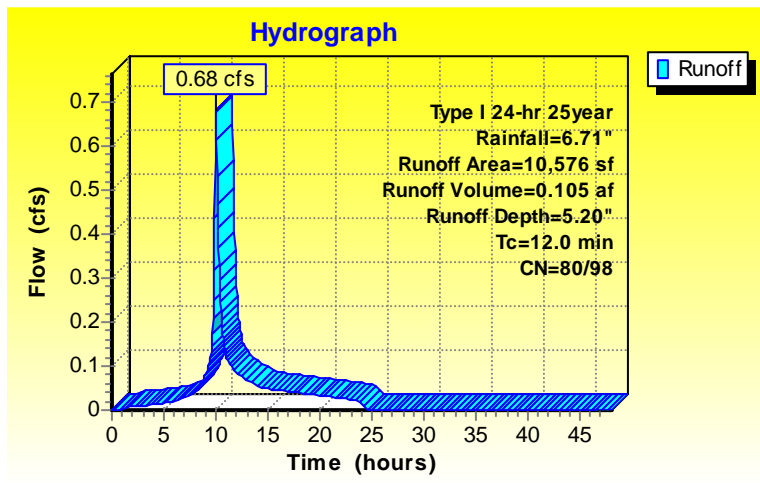
### Summary for Subcatchment 28S: Lot 6

Runoff = 0.68 cfs @ 9.98 hrs, Volume= 0.105 af, Depth= 5.20"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
4,000	98	Paved parking & roofs
6,576	80	>75% Grass cover, Good, HSG D
10,576	87	Weighted Average
6,576	80	Pervious Area
4,000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



### Summary for Pond 32P: Surface Basin

Inflow Area = 0.243 ac, 37.82% Impervious, Inflow Depth = 5.20" for 25year event  
 Inflow = 0.68 cfs @ 9.98 hrs, Volume= 0.105 af  
 Outflow = 0.63 cfs @ 10.05 hrs, Volume= 0.105 af, Atten= 8%, Lag= 3.6 min  
 Primary = 0.63 cfs @ 10.05 hrs, Volume= 0.105 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
 Peak Elev= 251.19' @ 10.05 hrs Surf.Area= 200 sf Storage= 138 cf

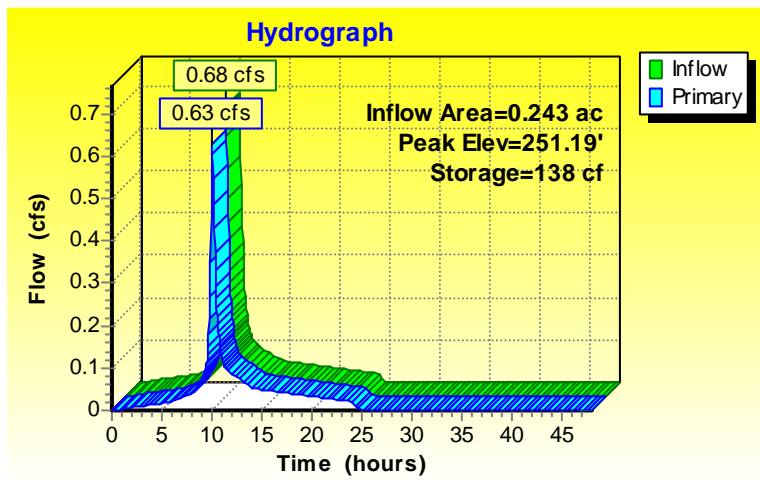
Plug-Flow detention time= 7.5 min calculated for 0.105 af (100% of inflow)  
 Center-of-Mass det. time= 7.6 min ( 750.2 - 742.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	250.50'	300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
250.50	200	0	0
252.00	200	300	300

Device	Routing	Invert	Outlet Devices
#1	Primary	250.50'	<b>6.0" Vert. Orifice/Gate</b> C= 0.600

**Primary OutFlow** Max=0.63 cfs @ 10.05 hrs HW=251.19' (Free Discharge)  
 1=Orifice/Gate (Orifice Controls 0.63 cfs @ 3.19 fps)



## LOT 7 + LOT 7 BASIN ROUTING 25 YEAR EVENT

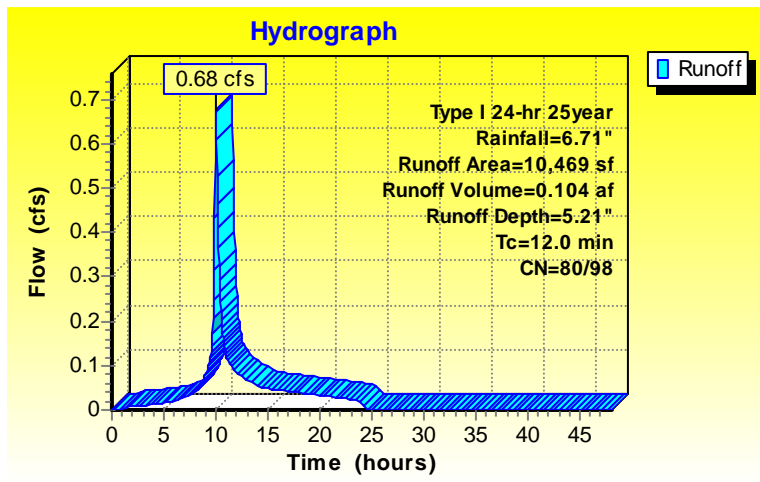
### Summary for Subcatchment 29S: Lot 7

Runoff = 0.68 cfs @ 9.98 hrs, Volume= 0.104 af, Depth= 5.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
4,000	98	Paved parking & roofs
6,469	80	>75% Grass cover, Good, HSG D
10,469	87	Weighted Average
6,469	80	Pervious Area
4,000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



### Summary for Pond 33P: Surface Basin

Inflow Area = 0.240 ac, 38.21% Impervious, Inflow Depth = 5.21" for 25year event  
 Inflow = 0.68 cfs @ 9.98 hrs, Volume= 0.104 af  
 Outflow = 0.62 cfs @ 10.04 hrs, Volume= 0.104 af, Atten= 8%, Lag= 3.6 min  
 Primary = 0.62 cfs @ 10.04 hrs, Volume= 0.104 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 247.18' @ 10.04 hrs Surf.Area= 200 sf Storage= 136 cf

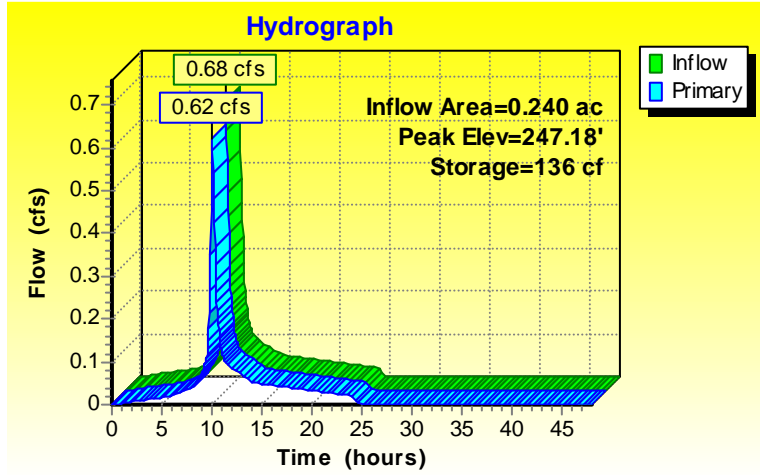
Plug-Flow detention time= 7.6 min calculated for 0.104 af (100% of inflow)  
 Center-of-Mass det. time= 7.7 min ( 749.9 - 742.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	246.50'	300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
246.50	200	0	0
248.00	200	300	300

Device	Routing	Invert	Outlet Devices
#1	Primary	246.50'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.62 cfs @ 10.04 hrs HW=247.18' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.62 cfs @ 3.15 fps)





## LOT 8 + LOT 8 BASIN ROUTING 25 YEAR EVENT

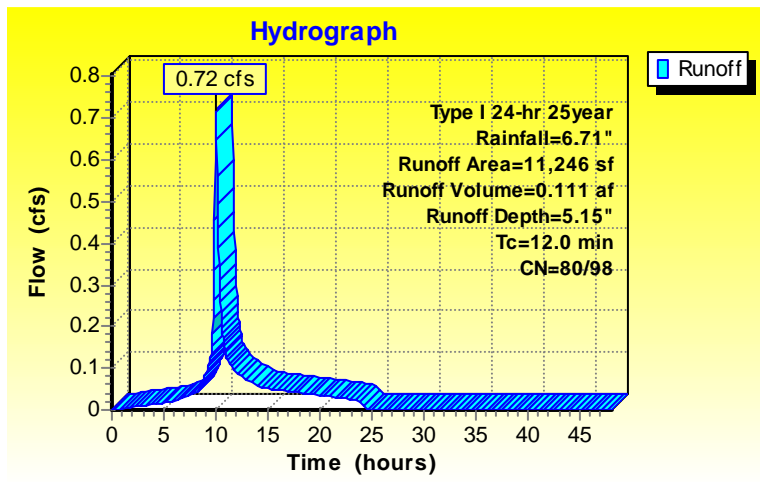
### Summary for Subcatchment 30S: Lot 8

Runoff = 0.72 cfs @ 9.98 hrs, Volume= 0.111 af, Depth= 5.15"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
4,000	98	Paved parking & roofs
7,246	80	>75% Grass cover, Good, HSG D
11,246	86	Weighted Average
7,246	80	Pervious Area
4,000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



### Summary for Pond 34P: Surface Basin

Inflow Area = 0.258 ac, 35.57% Impervious, Inflow Depth = 5.15" for 25year event  
 Inflow = 0.72 cfs @ 9.98 hrs, Volume= 0.111 af  
 Outflow = 0.66 cfs @ 10.05 hrs, Volume= 0.111 af, Atten= 9%, Lag= 3.7 min  
 Primary = 0.66 cfs @ 10.05 hrs, Volume= 0.111 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 242.23' @ 10.05 hrs Surf.Area= 200 sf Storage= 147 cf

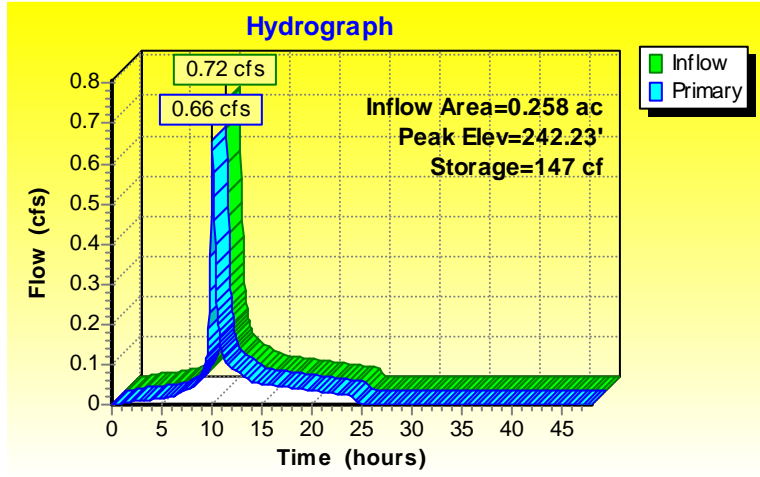
Plug-Flow detention time= 8.1 min calculated for 0.111 af (100% of inflow)  
 Center-of-Mass det. time= 7.5 min ( 752.1 - 744.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	241.50'	300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
241.50	200	0	0
243.00	200	300	300

Device	Routing	Invert	Outlet Devices
#1	Primary	241.50'	<b>6.0" Vert. Orifice/Gate</b> C= 0.600

**Primary OutFlow** Max=0.66 cfs @ 10.05 hrs HW=242.23' (Free Discharge)  
 1=Orifice/Gate (Orifice Controls 0.66 cfs @ 3.34 fps)



## LOT 9 + LOT 9 BASIN ROUTING 25 YEAR EVENT

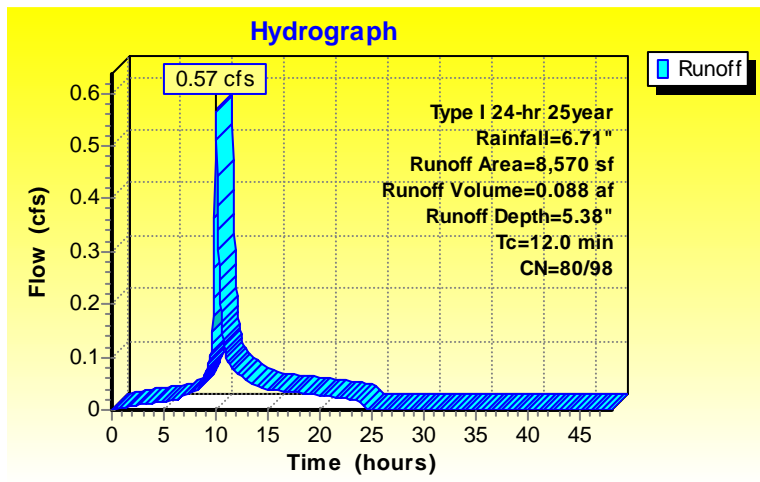
### Summary for Subcatchment 31S: Lot 9

Runoff = 0.57 cfs @ 9.98 hrs, Volume= 0.088 af, Depth= 5.38"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
4,000	98	Paved parking & roofs
4,570	80	>75% Grass cover, Good, HSG D
8,570	88	Weighted Average
4,570	80	Pervious Area
4,000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



### Summary for Pond 35P: Surface Basin

Inflow Area = 0.197 ac, 46.67% Impervious, Inflow Depth = 5.38" for 25year event  
 Inflow = 0.57 cfs @ 9.98 hrs, Volume= 0.088 af  
 Outflow = 0.53 cfs @ 10.04 hrs, Volume= 0.088 af, Atten= 7%, Lag= 3.2 min  
 Primary = 0.53 cfs @ 10.04 hrs, Volume= 0.088 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 247.06' @ 10.04 hrs Surf.Area= 200 sf Storage= 113 cf

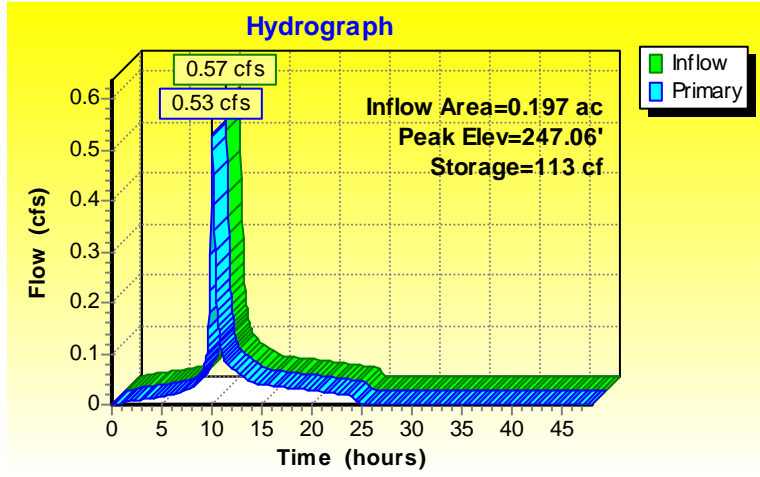
Plug-Flow detention time= 8.2 min calculated for 0.088 af (100% of inflow)  
 Center-of-Mass det. time= 8.3 min ( 743.0 - 734.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	246.50'	300 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
246.50	200	0	0
248.00	200	300	300

Device	Routing	Invert	Outlet Devices
#1	Primary	246.50'	<b>6.0" Vert. Orifice/Grate</b> C= 0.600

**Primary OutFlow** Max=0.53 cfs @ 10.04 hrs HW=247.06' (Free Discharge)  
 1=Orifice/Grate (Orifice Controls 0.53 cfs @ 2.68 fps)



## LOT 9 – REAR YARD

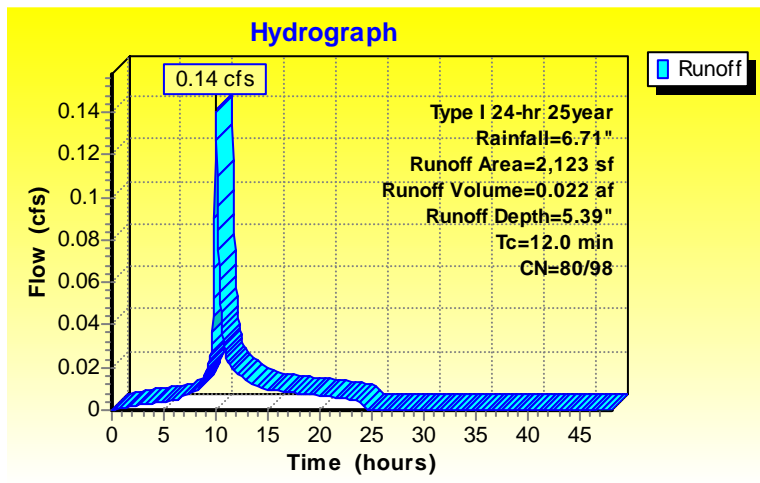
### Summary for Subcatchment 37S: Lot 9 rear

Runoff = 0.14 cfs @ 9.98 hrs, Volume= 0.022 af, Depth= 5.39"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
Type I 24-hr 25year Rainfall=6.71"

Area (sf)	CN	Description
1,123	80	>75% Grass cover, Good, HSG D
1,000	98	Paved parking & roofs
2,123	88	Weighted Average
1,123	80	Pervious Area
1,000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry,



## WEST – POST PROJECT RUNOFF – ALL EVENTS

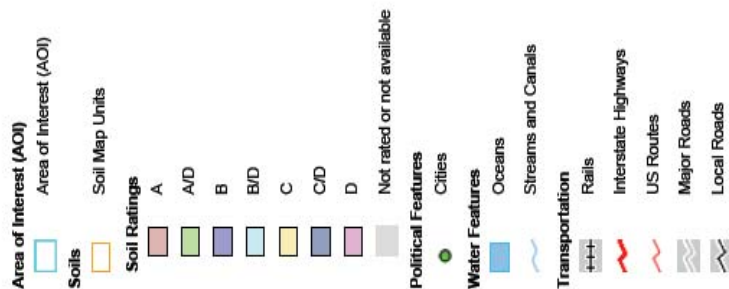
### Events for Reach 36R: V-Ditch

Event	Inflow (cfs)	Outflow (cfs)	Elevation (feet)	Storage (cubic-feet)
2year	1.29	1.29	240.44	10
5year	2.03	2.03	240.52	14
10year	2.50	2.50	240.57	16
25year	3.07	3.07	240.61	19
50year	3.47	3.47	240.64	20
100year	<b>3.84</b>	<b>3.83</b>	<b>240.66</b>	<b>22</b>
BMP	0.26	0.25	240.24	3

Hydrologic Soil Group—Santa Barbara County, California, South Coastal Part  
(W.O.#0359 - 457-459 N. Hope Ave.)



## MAP LEGEND



## MAP INFORMATION

Map Scale: 1:3,940 if printed on A size (8.5" x 11") sheet.  
 The soil surveys that comprise your AOI were mapped at 1:24,000.  
 Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
 Coordinate System: UTM Zone 11N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Santa Barbara County, California, South Coastal Part  
 Survey Area Data: Version 5, Jan 3, 2008

Date(s) aerial images were photographed: 6/6/2005; 6/7/2005

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



## Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Santa Barbara County, California, South Coastal Part				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
GcC	GOLETA FINE SANDY LOAM, 2 TO 9 PERCENT SLOPES	B	3.4	5.3%
MeD2	MILPITAS-POSITAS FINE SANDY LOAM, 9 TO 15 PERCENT SLOPES, ERODED	D	61.1	94.7%
Totals for Area of Interest			64.5	100.0%

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

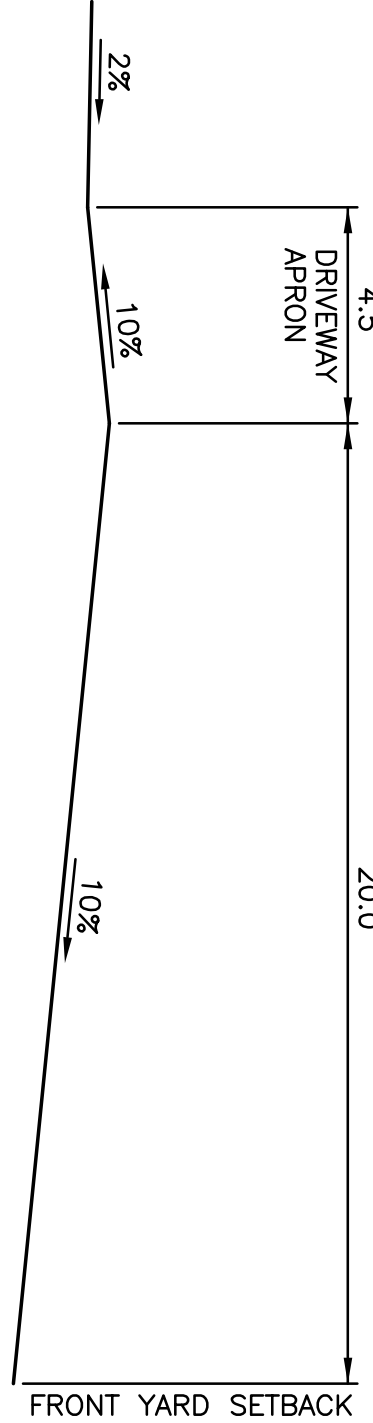
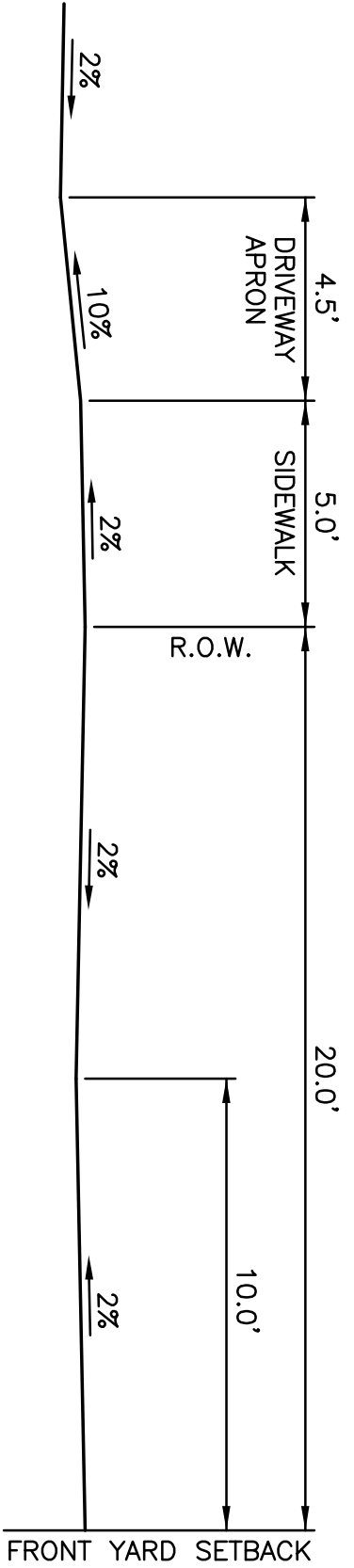
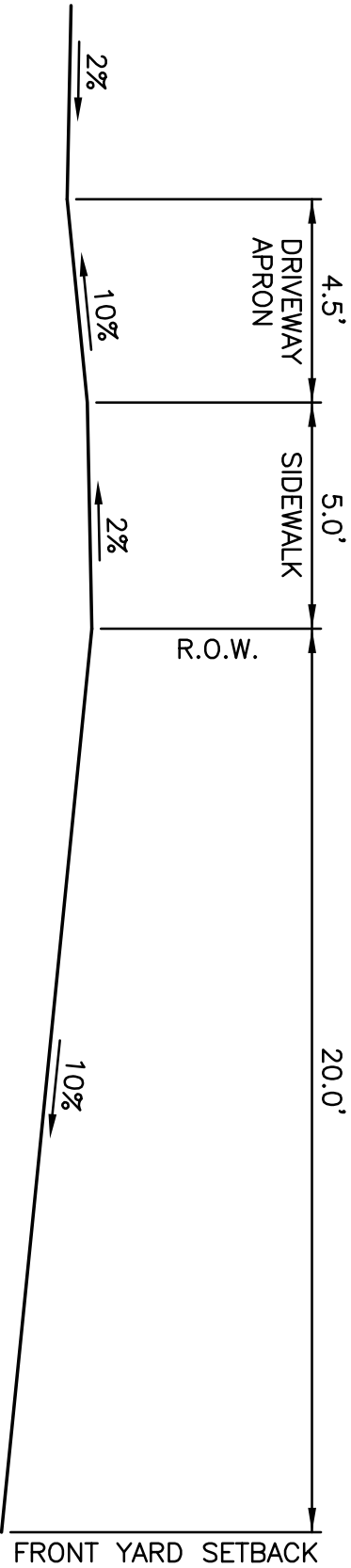
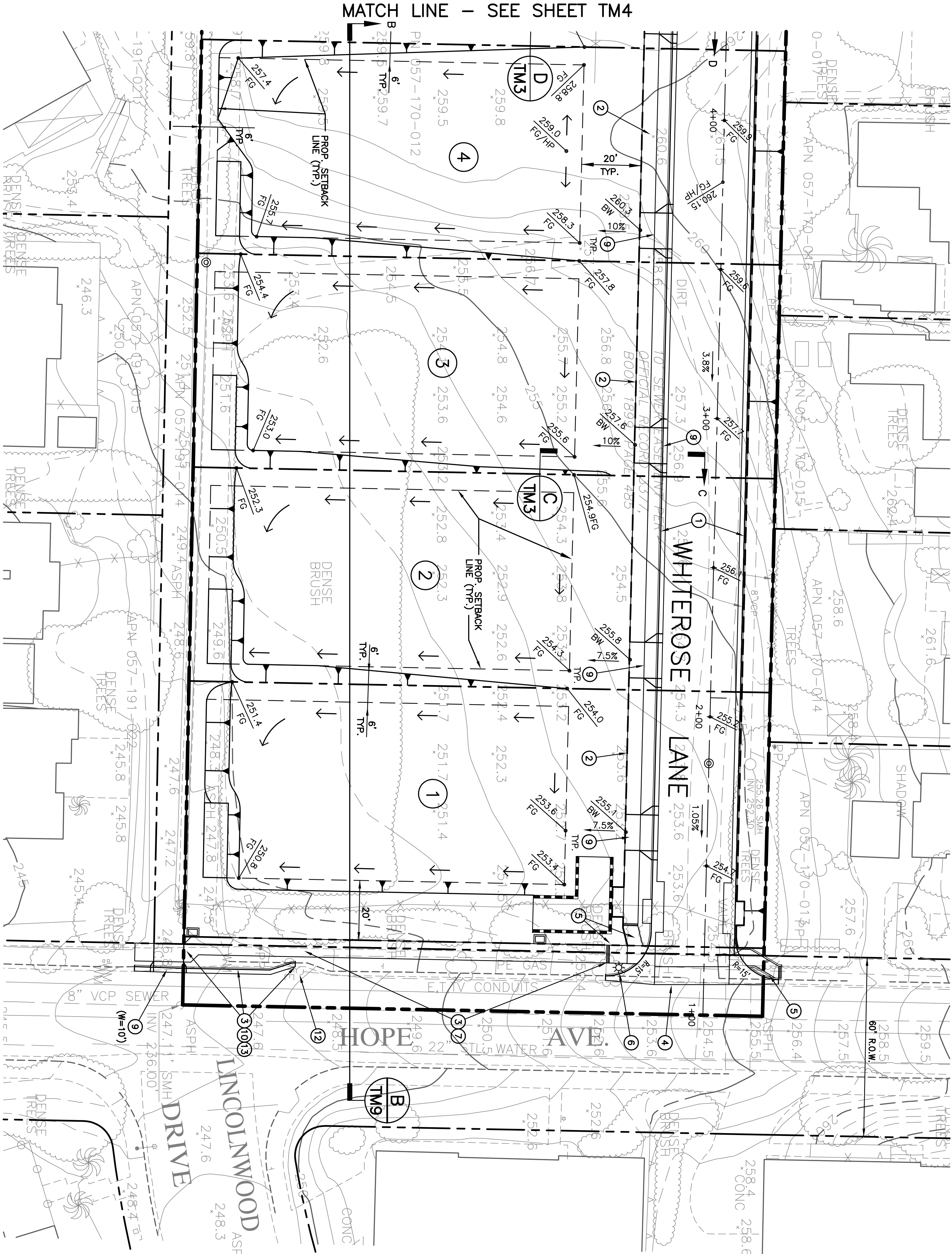
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

**PRELIMINARY GRADING & DRAINAGE PLAN**



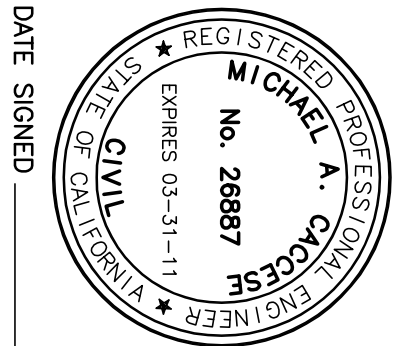
### PROPOSED IMPROVEMENTS

- STREET IMPROVEMENTS PER DETAIL 1 ON SHEET TM9.
- TYPE A SIDEWALK (WIDTH=5') PER CITY STD. DTL.S. 1--001.0--06, 1--006.0--06 & 1--006.1--06.
- TYPE A SIDEWALK (WIDTH=6') PER CITY STD. DTL.S. 1--001.0--06, 1--006.0--06 & 1--006.1--06.
- P.C. CONC. CROSS GUTTER & SPANDRELS PER CITY STD. DTL. 1--005.0--06.
- ONE WAY DIRECTIONAL ACCESS RAMP PER CITY STD. DTL.S. 1--007.0--10 & 1--007.2--10.
- LIGHT STANDARD (TYPE B--08) PER CITY STD. DTL. 3--002.0--08 & 3--002.1--08.
- FRONTAGE IMPROVEMENTS ON HOPE AVENUE PER DTL. 3 ON SHEET TM9.
- P.C. CONC. V--DITCH PER DETAIL 5 ON SHEET TM9.

### PROPOSED IMPROVEMENTS

- CONSTRUCT RESIDENTIAL DRIVEWAY (W=12' UNLESS OTHERWISE NOTED) PER CITY STD. DTL. 1--003.0--06.
- CONSTRUCT STD. CURB AND GUTTER PER CITY STD. DTL. 1--001.0--06 & 1--002.0--06.
- REMOVE EXISTING CHAIN LINK FENCE.
- EXISTING CURB & UTILITY VAULT TO REMAIN.
- FRONTAGE IMPROVEMENTS ON HOPE AVENUE PER DETAIL 4 ON SHEET TM9.

SEE SHEETS TM5 & TM6 FOR SEWER AND WATER IMPROVEMENTS.  
SEE SHEETS TM7 & TM8 FOR STORM DRAIN, CONC. "V" DITCH, DETENTION BASIN & OTHER DRAINAGE IMPROVEMENTS.



REFERENCES:  
DRAWING FILE: 0359PGDP.DWG  
PROJECT FILE:  
PROJECT NAME:  
VIEW NAME:  
XREF NAME(S):

NO.	DATE	REVISION	APPD.

**MAC Design Associates**  
CIVIL ENGINEERING • LAND PLANNING • BRIDGE DESIGN  
1000 N. GARDEN STREET, SUITE 200, GARDEN GROVE, CA 92640  
TEL: 714.942.1111 FAX: 714.942.1112

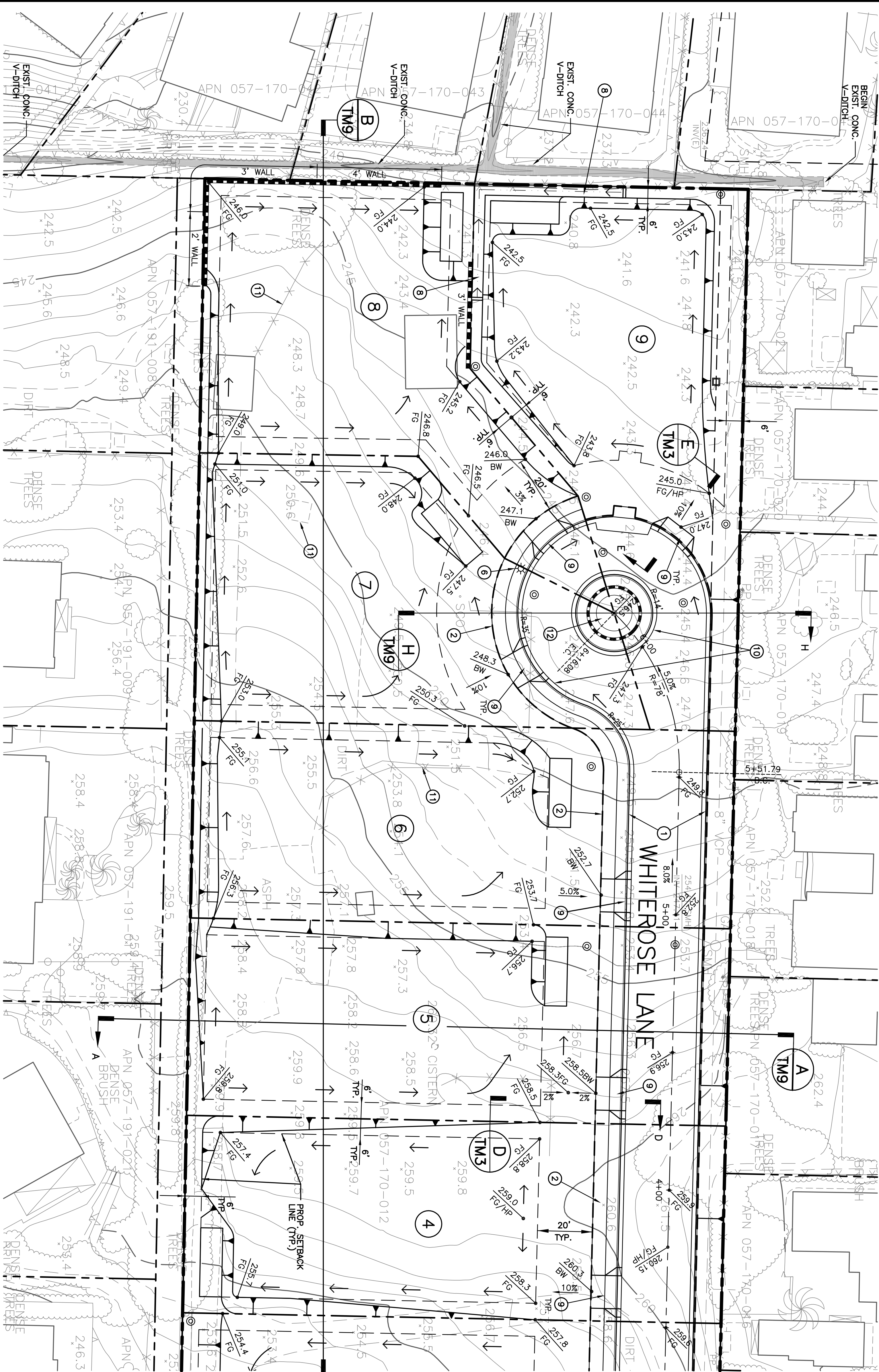
DESIGN: MAC  
DRAWN: TLA  
PROJECT ENGINEER: MICHAEL A. CAPOCASE  
DATE: 10-09-10  
R.O.C. 26687 (EXP. 3-31-11)

CITY OF SANTA BARBARA, CALIFORNIA  
REVIEWED BY:  
DATE:

**PRELIMINARY GRADING AND DRAINAGE PLAN**  
455, 457 & 459 HOPE AVENUE  
CITY OF SANTA BARBARA

SHEET  
**TM3 OF 9**  
S.B. CITY FILE  
NO.





MATCH LINE - SEE SHEET TM3

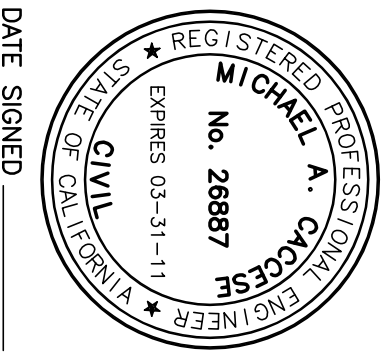
PROPOSED IMPROVEMENTS

- STREET IMPROVEMENTS PER DETAIL 1 ON SHEET TM9.
- TYPE A SIDEWALK (WIDTH=5) PER CITY STDs.
- TYPE A SIDEWALK (WIDTH=6) PER CITY STDs.
- P.C. CONC. CROSS GUTTER & SPANDRELS PER CITY STD. DTL. 1-005.0-06.
- ONE WAY DIRECTIONAL ACCESS RAMP PER CITY STD. DTLs. 1-007.0-10 & 1-007.2-10.
- LIGHT STANDARD (TYPE C-08) PER CITY STD. DTL. 3-003.0-08.
- FRONTAGE IMPROVEMENTS ON HOPE AVENUE PER DETAILS 3 & 4 ON SHEET TM9.
- P.C. CONC. V-DITCH PER DETAIL 5 ON SHEET TM9.

PROPOSED IMPROVEMENTS

- RESIDENTIAL DRIVEWAY (W=12' UNLESS OTHERWISE NOTED) PER CITY STD. DTL. 1-003.0-06.
- CUL-DE-SAC IMPROVEMENTS PER DETAIL H ON SHEET TM9.
- REMOVE EXISTING CHAIN LINK FENCE.
- MAXIMUM 28' WIDE DETENTION BASIN.

SEE SHEETS TM5 & TM6 FOR SEWER AND WATER IMPROVEMENTS.  
SEE SHEETS TM7 & TM8 FOR STORM DRAIN, CONC. "V" DITCH, DETENTION BASIN & OTHER DRAINAGE IMPROVEMENTS.



DATE SIGNED \_\_\_\_\_

REFERENCES:  
DRAWING FILE: 0359PGDP.DWG  
PROJECT FILE:  
VIEW NAME:  
XREF NAME(S):

NO.	DATE	REVISION	APPD.

**MAC Design Associates**  
CIVIL ENGINEERING • LAND PLANNING • BRIDGE DESIGN  
1525 CANYON DRIVE, SUITE 200, SANTA BARBARA, CA 93109 (805) 893-4748

DESIGN: MAC  
DRAWN: TLA  
PROJECT ENGINEER: MICHAEL A. CACCESI  
R.C.E. 26887

CHECKED: \_\_\_\_\_  
DATE: 10-08-10  
CITY OF SANTA BARBARA, CALIFORNIA

**PRELIMINARY GRADING AND DRAINAGE PLAN**  
455, 457 & 459 HOPE AVENUE  
APN 057-170-012  
CITY OF SANTA BARBARA

SHEET  
**TM4 OF 9**  
S.B. CITY FILE  
NO.